



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

basi decurrentibus membranaceis utrinque arachnoideo-tomentulosis plus minusve glabris, petiolis alatis, foliis superioribus sessilibus lanceolatis irregulariter dentatis; pedunculis elongatis usque ad 8 cm. longis unicapitatis; capitulis 1.8-2 cm. altis multifloris radiatis subnutantibus; involucris campanulatis calyculatis; squamis involucri lineari-lanceolatis 13-15 mm. longis apice acutis penicillatis extrinsecus arachnoideo-tomentulosis; floribus femineis 12-15, ligulis lanceolato-oblongis 12-15 mm. longis 3-4 mm. latis flavis; floribus disci numerosis, corollis ca. 8.5 mm. longis; pappi setis albidis subaequantibus; achaeniis glabris.

On talus slopes of Mt. Angeles, Clallam County, Washington, altitude about 2000 m., 2 September, 1909, *E. B. Webster*, no. 109 (hb. Field Museum cat. no. 251971).

In habit *S. Websteri* is similar to *S. seridophyllus* Greene which, however, is glabrous throughout and has smaller heads and shorter rays. In foliar characters *S. Websteri* resembles *S. Elmeri* Piper, but differs in having much larger and solitary heads. Mr. E. B. WEBSTER of Port Angeles, by whom the specimens were collected, in commenting on the plant, states: "There are possibly a hundred plants in all, a few growing at the northern side of the base of one of the pinnacles, the remainder being scattered along the narrow rocky talus for possibly 1000 ft.; on the slope at the base of the pinnacle *Arnica cordifolia* Hook. and *Heuchera racemosa* Wats., both rare on Mt. Angeles, were associated with the *Senecio*, and somewhat lower down *Hedysarum occidentale* Greene and *Arabis Lyallii* Wats. were growing along with it."—J. M. GREENMAN, *Chicago*.

---

## SOIL MOISTURE IN THE COTTONWOOD DUNE ASSOCIATION OF LAKE MICHIGAN

(WITH ONE FIGURE)

The following data regarding the range of soil moisture in the cottonwood dune association upon the shores of Lake Michigan seem to be of sufficient interest to warrant their publication in advance of the results of more extensive studies of the same sort now in progress. The work of COWLES<sup>1</sup> upon its general ecological relations and that of the writer<sup>2</sup> upon the evaporating power of the air have shown this to be an open association of a single tree species, together with a scanty undergrowth

<sup>1</sup> COWLES, H. C., The ecological relations of the vegetation of the sand dunes of Lake Michigan. *BOT. GAZ.* 27:95-391. 1899.

<sup>2</sup> FULLER, G. D., Evaporation and plant succession. *BOT. GAZ.* 52:193-208. 1911.

of shrubs and grasses, developing upon more or less rapidly moving dunes, possessing a very high rate of evaporation, exhibiting many strongly xerophytic characters, and almost entirely dependent upon vegetative reproduction for its maintenance. The almost complete absence of herbaceous undergrowth and the expanse of bare sand give it a desert-like aspect, but below the superficial layer of dry sand an abundant and unfailing water supply has been found.

From the beginning of May to the end of October 1911 duplicate samples of about 125 grams of soil were taken weekly at depths of 7.5 cm. and 25 cm., the soil dried at 104° C., and the ratio of water to the dry weight of soil found to range from 2 to 8 per cent, an apparently very inadequate amount.

Until recently no satisfactory means of relating such soil moisture determinations to plant growth have been available but the "wilting coefficient" of BRIGGS and SHANTZ<sup>3</sup> now indicates the limit of soil water content above which growth must occur, although plants will live and continue to draw water from the soil much below this limit. Further, the same workers have shown that many plants differ very little in their wilting coefficients from the standard Kubanka wheat. As under ordinary conditions a water supply very little above that at which wilting occurs is sufficient for some growth, the difference between the soil moisture actually present at any time and the wilting coefficient of the soil represents approximately the amount of water available for purposes of growth, and this, in the absence of a better term, may be referred to as "growth water."

Following the methods of BRIGGS and SHANTZ (*loc. cit.*), the wilting coefficient of the dune soil was found to be 0.75 per cent at both depths, the absence of humus accounting for this similarity. Graphically representing this wilting coefficient and plotting the soil moisture determinations as graphs having the weekly intervals as abscissae and the percentage of water present in the soil as ordinates (fig. 1), it will be seen that the moisture present in the soil of the cottonwood dune is at all times more than double the wilting coefficient, or in other words there is always present at least twice the amount of water necessary for the growth of such a plant as wheat. Throughout the most arid portion of the season, namely the ten weeks beginning with the first of July, the surplus or growth water averages 2.2 per cent, showing that,

<sup>3</sup> BRIGGS, L. J., and SHANTZ, H. L., The wilting coefficient for different plants and its indirect determination. U.S. Dept. Agric., Bur. Pl. Ind. Bull. 230, 1912; also BOT. GAZ. 53:20-37, 229-235. 1912.

considered upon the basis of its soil moisture, the association is decidedly mesophytic. The causes of the xerophytic character of the vegetation must be sought in the high evaporating power of the air and in the instability of the substratum. These factors, however, doubtless react upon the surface of the soil and tend to conserve the soil water by constantly maintaining a dry surface mulch. The constant presence of a sufficient amount of moisture perhaps will help to explain the readiness

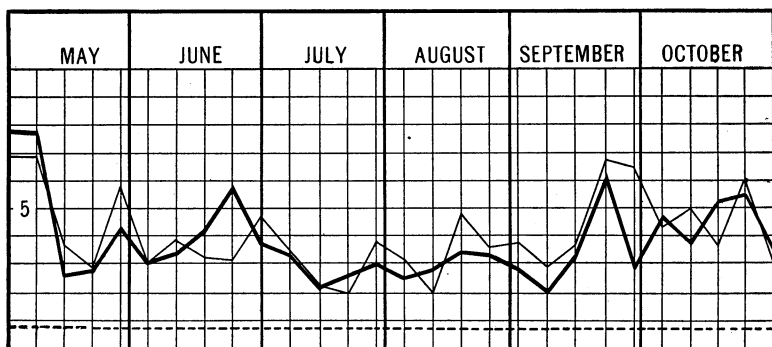


FIG. 1.—Graphs showing the range of soil moisture in the cottonwood dune; the heavy line at 7.5 cm. and the light line at 25 cm. depth; wilting coefficient represented by a broken line.

with which vegetative reproduction occurs within the association, while the shifting sand and high rate of evaporation may account for the almost entire absence of seedlings of any sort.

From these scanty data it would seem that determinations of soil moisture, related to plant growth through the wilting coefficients of the soil, will afford an efficient means of making quantitative studies of the water supplies of the subterranean parts of plant associations, and, as in the present instance, enable students of ecology to analyze more closely the effects of the various factors influencing the production of any particular plant association.—GEO. D. FULLER, *The University of Chicago*.